

# Environmental Windows as Emerging Issues in Europe

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# Definition

“Environmental windows are those periods of the year when dredging and disposal activities may be carried out because regulators have determined that the adverse impacts associated with dredging and disposal can be reduced below critical thresholds during these periods. Environmental windows, therefore, are used as a management tool for reducing the potentially harmful impacts of dredging activities on aquatic resources.”

– *NAS Workshop Report*

# Reflections

- Focuses attention on
  - identification of potential impacts
  - critical thresholds
- Does not focus on
  - the need or importance of the dredging project.
- Step 2D of the NAS Process
  - recognises that “need” should be evaluated but..
  - “the template is designed for federal projects that have been pre-approved and for which funds have been appropriated.”
  - Result - **CONFLICT**

# More reflections

- “Windows” .....
  - Assumes detrimental effects avoided if dredging prevented during times when biological resources sensitive to disturbance.
  - requires good knowledge of environmental effects of dredging, which generally is poor, therefore.....
  - a precautionary approach is adopted
- USACE District responses confirmed that dredging projects are often delayed and, in rare cases, cancelled because of restrictions.
- Evaluation handicapped by lack of information on impact.

# Emerging in Europe

- USA
  - Windows introduced 30 years ago
  - Now applied to 80% of civil and maintenance dredging works
- Europe
  - Most dredging operations have taken place all year round
  - Recent introduction of the EU Directives
    - Conservation of Natural Habitats
    - Protection of birds
  - Windows being considered
  - Little experience to report so.....

# Europe?

- Europe is looking at the US experience
  - *Do we want to follow in the same way?*
  - *What can we learn and maybe improve on?*
- Example of two cases in Europe
  - Hamburg, Germany
  - Port of London, UK
- Conclusions

# Environmental Impacts

- A) Physical disturbance of nesting and spawning, destruction of habitats, especially
- disturbance of fish spawning habitats
  - physical removal of benthic faunal communities
  - physical removal of protected plants
  - disturbance of fish and benthic faunal feeding habitats

# Impacts

## B) Detrimental effects of suspended sediments, turbidity and sedimentation, especially

- disturbance of fish spawning and nursery habitats
- disturbance of fish larval development
- effects on the behaviour of migrating fishes
- effects on feeding of larval, juvenile and adult fishes
- reduction of fish fitness and production, enhancement of mortality rate
- burial of benthic fauna communities
- disturbance of benthic fauna development
- enhancement of photosynthetic oxygen production of plankton algae
- burial of benthic plants

# Impacts

- C) Degradation of water quality, especially in zones with low energy and in waters with sediments with high organic content
- impairment of fish larval development
  - impact on adult fishes (e. g. bioaccumulation)
  - impact on benthic organisms
  - enhancement of algal growth

# Impacts

## (d) Hydraulic entrainment

- effects on juvenile and larval fishes
- effects on benthic fauna

## (e) Disturbance of nesting and breeding activities by noise

## (f) Disturbance of navigation

## (g) Disruption of recreational activities

*During disposal activities, the most commonly cited reason for environmental windows is the potential detrimental impact to anadromous fishes.*

# Windows Assessment Procedure

## LaSalle et al

- 1. *Identification of critical periods*
  - At first, target populations for protection have to be determined. Critical times of development, and main time of growth, breeding, foraging, rearing, or migration have to be identified.
- 2. *Risk assessment*
  - In periods of high biological activity assessment of the potential impacts of dredging or dredging disposal on resources of concern is required.
  - Important operational characteristics.....

# Windows Procedure contd.

- Distance of disposal area to sensitive biological habitats
- Distance to fish migrations
- Sediment transport characteristics
  - benthic biological communities susceptible to enhanced suspended sediment concentration.
  - influenced by hydrodynamics geomorphology and composition of suspended material.
- Relation to natural dynamics of water quality
  - do concentrations of suspended sediments, nutrients and dissolved oxygen exceed natural maxima or minima for that season?

# In Europe....

- Many dredging areas are near areas designated under European Directives
- Legal obligation to ensure that activities do not cause detriment to:
  - flora,
  - fauna,
  - specific habitat types
- Designations made knowing that routine dredging operations have been undertaken for considerable periods of time.

# Hamburg experience (1)

- Operations upriver of harbour not allowed April - October to avoid effects on sensitive biological resources
- River Elbe has:
  - high fish production
  - high benthic faunal population density
  - high species diversity
  - regular oxygen deficits in the tidal regions
  - biogenic oxygen production may be possible only at water surface.

# Hamburg experience (2)

- Investigations since 1994 focused on sediment transport, effects on water quality, and benthic communities.
- Literature review - impact of disposal operations on biological organisms and oxygen regimes of tidal waters
- Found significant but short term near field impacts of disposal operations on suspended sediments and oxygen regime.
- Long-term effects can't be excluded.

# Hamburg experience (3)

- High natural variation of suspended matter - difficult to study transport and final destination of dredged material.
- Impairments of biocenosis might occur due to enhanced input of solids and variation of the water quality in some parts of the river, especially in shallow waters near the river bank where fish live
- Effects on oxygen depend on the discharge rate and composition of the dredged material.
- The study showed that the environmental window presently applied is longer than it needs to be.

# Port of London reservations

- Decisions should be informed by science rather than speculation, ie not over precautionary
- Essential to understand the mechanism for a particular potential effect
- Set impacts in context eg.
  - the proportion of the resource likely to be affected
  - the ability of the population to recover

## PLA (2)

- Mitigation should be considered eg.
  - reducing overflow
- Windows should be flexible - ie. the start and end points should be triggered by monitoring - rather than setting a precautionary time.
- It should be possible to revise existing windows as new information becomes available.

# Concluding remarks

- Looks like a simple tool but a “blunt instrument”
- Severity in application in the US (seek to avoid such problems in Europe).
- Unreasonable pressure on promoters to prove that it will not cause harm
- Difficult thing to do for a number of reasons:
  - Difficult to establish the baseline
    - Not usually steady state - implies monitoring for many years and correlating with other parameters.
  - Implies knowing which parameters actually cause harm. Is it turbidity?

# A dredging induced turbid plume

We can see it but....

What is it that we see?

Is it important?



# Measurement of turbidity

- Few attempts at total measurement of sediment release
- Inherently difficult due to:
  - temporal variations
  - spatial variations
  - settling
  - resuspension
  - turbulent mixing
  - hydrodynamic advection etc.

# Turbidity example

- Necessary to predict effects on sensitive species.
- Little done in the field to verify predicted impacts
- Laboratory experiments generally not conclusive.
- Result? Standards or windows based on something:
  - not yet capable of being measured
  - not yet capable of being predicted
  - actual environmental impact hardly known.

# Penny's Bay- Hong Kong

## **7 MILLION FISH DIE!!**

*“Dredging work for the new Disney Park is responsible for turning the sea muddy and suffocating millions of fish around the site of Penny's Bay”*

*“The fish kept coming up for air, they must have suffered” says fisherman (as he puts in his claim for compensation)*

*Daily Telegraph 12 April 2002*

# Negative consequences of Windows

- Increased costs due to inefficient dredging
- Over-capacity in non-dredging seasons
- Under-capacity in the dredging window
- Intensive dredging during Window
  - bigger dredgers
  - more dredgers
  - faster working
  - higher rates of sediment release
  - more environmental damage?
- Over-dredging to provide capacity for siltation
- Possible closure of ports
  - social consequences
  - economic consequences

# Do we want Windows in Europe?

- Windows concept should be seen as a tool of last resort.
- Before it is applied,
  - all reasonable attempts should be made to identify whether there is really likely to be any significant adverse effects
  - mitigation methods should be investigated
- Solution?
  - Research to better understand actual effects
  - Research into mitigation methods
  - More technically informed and less adversarial dialogue

**Thanks for listening**

